

The Effect of Lanthanum Addition on the Microstructure and Mechanical Properties of A390 Aluminium Alloy

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Abstract

Aluminium alloys are widely used in the industries and for biomedical applications, because when compared with other materials they provide a high strength-to-weight ratio, better wear resistance, less density, and low coefficient of thermal expansion. However, these alloys possess some limitations in terms of the interactive effects of additives. Therefore, the target of this research is to study the influence of Lanthanum addition of 0.5, 1.0, and 1.5 wt% on the microstructure and mechanical properties of hypereutectic Al–Si alloy. Optical microscopic test, FESEM spectroscopy, XRD, and mechanical properties testing, such as tensile, impact, and hardness test were carried out for characterization purposes. The result indicates the formation of intermetallic compounds, while the value of the secondary dendrite arm spacing became smaller with increasing La addition. The optimum modification of A390 alloy eutectic structure was at 1.0 wt% of La, which improved the ductility from 0.7 to 1.8% and a recorded increase in tensile strength from 100 to 150 MPa.

Keywords

Aluminium alloy Rare earths Modification Microstructure Mechanical properties